

Laboratory Investigations in General Practice

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SUMMARY

Forty-eight family physicians completed a 10-item questionnaire about their use of laboratory investigations, and "ordered" tests for five clinical vignettes, estimating the cost of tests ordered. Physicians practising less than 10 years ordered more tests and overestimated the cost. Patients' expectations and risk of litigation affected test-ordering behaviour. Strategies to manage resources dedicated to laboratory investigations are explored.

RÉSUMÉ

Quarante-huit médecins de famille ont complété un questionnaire de 10 items concernant leur utilisation des investigations de laboratoire. On leur a aussi demandé de prescrire des tests se rapportant à cinq vignettes cliniques, tout en estimant les coûts des tests prescrits. Les médecins en pratique depuis moins de 10 ans ont prescrit plus de tests et en ont surestimé les coûts. Les attentes des patients et les risques de poursuite légale ont affecté le comportement face à la prescription des tests. L'article explore certaines stratégies visant à contrôler les ressources que sont les tests de laboratoire.

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THE COST OF HEALTH CARE IN Ontario increases every year. In 1982 the total expenditure of the Ontario Ministry of Health was \$6770 million.¹ By 1990, the total expenditure had reached \$15 005 million, more than doubling in 9 years.²

One area of consistent growth is the use and cost of laboratory investigations. In Ontario, health insurance payments to outpatient commercial laboratories alone, not including hospital laboratory costs, increased from \$192 million in 1982³ to \$353 million in 1988.⁴

It is difficult to argue against the intelligent use of laboratory investigations in the practice of modern medicine. However, laboratory investigations used carelessly can become a substitute for clinical skills, sometimes providing useless, superfluous, or misleading information and further threatening an already precarious health care budget.^{5,6}

The steady increase in health care costs cannot continue indefinitely. Linton and Peachey⁷ note that, in the United States and Britain, health care expenditures are strictly monitored through external

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controls. In 1989, they bluntly warned Canadian physicians:

Likely, utilization control will be imposed in Canada very soon unless the profession behaves responsibly by designing and introducing improved management systems that will reduce waste yet remain "physician friendly" and thus avoid the extreme intrusion of supervised care seen in the United States.⁷

Fears of those sorts of controls are increasing among physicians. Some medical authors, many of them practising in academic settings, write convincingly of the need for primary care physicians to act as "gatekeepers" to the "health care marketplace"⁸⁻¹¹ and to share in the responsibility for maximizing the use of available health care resources.

Responsibility for cost control of laboratory investigations is particularly important for family physicians, who see and assess patients first and determine the initial number of tests ordered. Family physicians appear to order most of the laboratory investigations carried out by commercial laboratories in Ontario; the number of investigations increased about 50% between 1983 and 1988.¹² Eisenberg and Williams¹³ reflect on the financial responsibility borne by physicians and review data that reveal physicians' ignorance of the cost of the medical services they order.

The literature suggests that physicians are not as careful as they might be when it

Table 1. Respondents' profile

YEARS OF PRACTICE	MEN		WOMEN		TOTAL
	CCFP	NON-CCFP	CCFP	NON-CCFP	
< 10	7	7	5	3	22
≥ 10	8	16	1	1	26
TOTAL	15	23	6	4	48

comes to ordering laboratory tests and that the increase in laboratory investigations over the past 10 years might not result in better care.^{5,14}

Many factors affect test-ordering behaviour. Williams and colleagues¹⁵ surveyed a group of residents, hospital consultants, and community internists to determine physician perception of the reasons for overuse of diagnostic tests. They found, predictably, that the different groups had different perceptions. Community internists cited routine screening, habitual ordering of groups of tests, and concern about possible malpractice – all reasons that do not address patients' medical problems. Moreover, evidence suggests that admission screening tests in hospitals do not improve patient care but do increase hospital costs significantly.¹⁶

Many attempts have been made to modify physician test-ordering behaviour. Reviewing these efforts, Young¹⁷ concludes that different groups require different strategies, but he calls for long-term cost containment programs and a commitment from medical educators to control costs.

Much of the available information about laboratory use reflects the behaviour of residents, physicians practising in university hospitals, or specialists in internal medicine.¹⁸⁻²⁰ In this project, the test-ordering practices of a group of family physicians were compared, using a set of five clinical vignettes. Our main purpose was to assess the ability of these physicians to estimate the cost of the laboratory tests they order. Factors affecting the number of tests ordered were also explored.

METHODS

All the active and associate members of the Family Practice Department at a 300-bed southern Ontario hospital were approached to participate in this study. All

the physicians have private practices in the hospital's catchment area and provide care for their hospitalized patients. We used a questionnaire and a set of five clinical vignettes. The questionnaire collected the following information: years of practice, sex of practitioner, certification by the College of Family Physicians of Canada (CCFP), average number of patients seen per day, and the availability of laboratory facilities in their building. The physicians were asked whether they believed patient expectations and the potential for litigation had increased over the past 10 years. They were then asked whether they thought patient expectations and the perceived increased risk of litigation affected their test-ordering behaviour.

The second part of the questionnaire presented five clinical vignettes, designed to reflect a variety of problems encountered in family practice, with a variety of possible solutions. Many types of tests could be "ordered," allowing us to assess the ability of physicians to estimate cost in a variety of situations.

Vignette No. 1 described a 42-year-old married mother and part-time teacher who complained of fatigue. Vignette No. 2 presented an asymptomatic 36-year-old woman who, on routine testing at the time of her annual physical, had normal results from a complete blood count, urinalysis, and Pap smear but a low thyroxine level. Vignette No. 3 presented a 54-year-old man with type II diabetes, hypertension, obesity, and possible alcohol abuse. Vignette No. 5 described a healthy 43-year-old woman complaining of hot flashes for 3 months and menorrhagia for 6 months. Following is vignette No. 4, as presented on the questionnaire.

Janet is 17 and in Grade 12. She is requesting the birth control pill. She is using condoms at present. She has no history of sexually transmitted diseases, reports no abnormal vaginal discharge, and is healthy. Her past medical history is negative. Blood pressure is 110/60 mm Hg. She has one partner.

The physicians were asked to indicate what tests they would order if they were presented with these clinical problems in their own practices. They filled in standard laboratory requisitions for the patients described in each vignette and then were asked to estimate the total cost of the tests they had ordered for each vignette. The actual cost of the tests ordered was determined by a single laboratory in the area, using the OHIP fee schedule.

When the physicians were asked to participate, it was made clear there were no "right" answers. There was no attempt to judge quality of care based on the numbers or kinds of tests ordered. No attempt was made to determine whether physicians would order the same tests on another occasion. We simply analyzed how many tests were ordered for each vignette and the physicians' ability to estimate the cost of what they had ordered.

RESULTS

Of 66 physicians approached, one declined to participate and 48 returned the completed questionnaire, resulting in a response rate of 73%. Demographic data for nonrespondents was compared with respondents, and no significant differences were found. *Table 1* shows the respondents' profile.

According to the records of the Ontario Chapter of the College of Family Physicians, approximately 31% of active Ontario family physicians are women, and 38% of Ontario physicians are certificants of the College. Our group was similar, with 21% of the group being women and 44% of the whole group being certificants.

Responses to the questionnaire indicated that physicians saw between 10 and 60 patients on an average day, with a mean (standard deviation) of 29 (10). Most of the physicians (94%) thought patients benefited from the convenience of a laboratory in the same building as a doctor's office, and 59% reported such an arrangement.

Analysis of each vignette demonstrated a great variability in the numbers, types, and total cost of tests ordered by

physicians, all of whom practise in the same community and attend at the same hospital. For example, in Vignette No. 4 the number of tests ordered was between 0 and 19, with "costs" ranging from \$0 to \$110 (*Table 2*).

In order to identify any trends by group, a covariant analysis was performed using the total number of ordered tests as the dependent variable. Independent variables in the analysis included years of practice, laboratory facilities in the building, sex, number of patients seen per day, and certification. Covariance analysis identified no significant factors. This was probably due to lack of power: too many variables and too small a sample. Nevertheless, there was a difference by sex: female physicians ordered a mean of 31.2 tests while male physicians ordered a mean of 26.7. This difference was found to be statistically significant ($P = 0.02$) using a z score. All other variables were analyzed in the same fashion. The only other variable that reached statistical significance was years of practice ($P = 0.04$). These results must be interpreted carefully, however, because 80% of the women in the study, but only 37% of the men, had been practising less than 10 years.

Ordering patterns were somewhat consistent. The one third of physicians who ordered more tests than the average for one vignette also ordered more than the average for all vignettes.

The physicians' ability to estimate the cost of the tests they ordered was analyzed. Ability to estimate was calculated with 20% range around the actual cost. (For example, if a series of tests actually cost \$50, the 20% range would be between \$40 and \$60.) All of the physicians had difficulty estimating the cost of tests ordered; 73% either overestimated or underestimated costs by more than 20%. Interestingly, 49% of the physicians overestimated the costs by more than 20%, believing tests cost more than they actually do (*Table 3*).

Each physician's ability to estimate cost was calculated by assigning points that reflect how often and by how much the estimated cost deviated from the actual cost of the tests ordered on each vignette. Covariance was analyzed using this total score for each physician as the dependent variable. Female physicians had more difficulty estimating cost ($P = 0.04$).

Using a *z* score for two independent proportions, the group overestimating cost in four or more vignettes was analyzed. Again, having practised less than 10 years

Table 2. Number and actual cost of tests ordered: *n* = 48 for each vignette.

VIGNETTE	RANGE	MEAN	SD
NO. OF TESTS ORDERED			
No. 1	2-16	8.6	3.2
No. 2	0-6	2.4	1.3
No. 3	2-18	10.9	4.3
No. 4	0-19	5.5	4.5
No. 5	2-20	9.0	4.2
ACTUAL COST OF TESTS ORDERED*			
No. 1	\$8-116	\$50	25.1
No. 2	\$0-123	\$41	19.2
No. 3	\$12-153	\$62	31.6
No. 4	\$0-110	\$36	26.6
No. 5	\$9-178	\$70	42.8

*Figures for range and average have been rounded to the nearest dollar.

(*P* = 0.01) and being female (*P* = 0.05) appeared to be statistically significant.

Finally, the issues of increased patient expectations and increased perceived risk of litigation were analyzed. Most physicians (89%) indicated that they believed patient expectations and demands influenced their test-ordering behaviour. Of these physicians, 8% thought their test-ordering behaviour was strongly influenced by patient expectations. Moreover, 73% of the physicians believed patients expect more tests now than they did 10 years ago. Almost all (92%) believed there was a greater risk of involvement in litigation now than 10 years ago, and 91% of this group believed their test-ordering behaviour was affected by this perceived risk of litigation.

DISCUSSION

Health care costs are increasing year by year, and the system, as we know it, is

threatened. Government is attempting to control costs, and physicians have begun to look at their own responsibility for cost containment. This project was undertaken to assess the knowledge of a group of family physicians about the cost of laboratory investigations. We also hoped to identify factors related to test-ordering behaviour. Such information might be useful in developing strategies to modify physician behaviour, thereby decreasing costs.

The study showed that, as a group, the physicians had very little sense of the cost of laboratory investigations. This is consistent with the American data.¹³

Thirteen respondents wrote comments on the questionnaire. One wrote:

Huge sums are being wasted on unnecessary tests, and doctors need a great deal of help in this regard. We need CME [continuing medical education] directed to investigations [indications and cost],... public awareness campaigns,... and patient responsibility for costs.

One reported, "I don't consider cost when ordering tests... could order less." Three commented that "fashions" in medicine (particularly lipid levels, β -human chorionic gonadotropins, and computed tomographic scans) affect patient demands. Eight reflected the view that *patients* behave as though tests were free. Some doctors recommended that the cost of the tests ordered should be entered on laboratory reports, to educate both patients and physicians.

Under the current OHIP system, not only are costs not on laboratory slips, but it is time-consuming to ascertain the cost of a specific test or series of tests. The basic "currency" of laboratory medicine is the (LMS) unit value, 51.7 cents as of February 1992. Each laboratory test is assigned a number of units which, when multiplied by the LMS unit value, gives the cost of the test. This basic process is made more complex by maximum costs of groupings of tests, the urgency of tests, and so on. Physicians are not informed of the individual or total costs of what they order or how their behaviour compares with that of their colleagues.

Other researchers have suggested that physicians might be more careful in ordering investigations if they were more aware of cost. In the group of American physicians

studied by Long and colleagues,²¹ the over-estimators tended to order fewer tests, indicating a rational response to cost. In this study, however, the Ontario physicians who had practised less than 10 years ordered more laboratory investigations than their senior colleagues. Yet this group thought investigations cost even more than they actually did, displaying an apparent disregard for cost. This finding suggests that more awareness of cost might not in itself result in more careful use of health care resources. Further research might profitably be carried out in Ontario to assess the value of informing patients and physicians of the costs of tests. Would this information change physician behaviour? Would it affect patient expectations? Would physicians think more about the tests they ordered if they knew they were, as compared with their colleagues, "high orderers?"

Ferrier et al found, in their study of the OHIP billings of 644 Ontario primary care physicians, that women ordered more laboratory investigations than men, but also found that practice types accounted for most of the differences.²² Female physicians in our study also ordered more investigations than did their male colleagues. However, high and low orderers can be identified here largely by years of practice.

Physicians with fewer than 10 years of practice tended to order more than the average number of tests in four or more vignettes. (Yager and colleagues²³ also found that physicians who ordered more for one vignette tended to order more for other vignettes.)

Why might less experienced physicians order more tests? They were trained in an environment more oriented to laboratory investigations than were their more senior colleagues, and more tests were available to them during their training. In most Canadian teaching hospitals, little attention has been paid to the issue of cost control.

Much of the training of Canadian physicians takes place in large teaching hospitals, with a sick inpatient population. The predictive value of the laboratory investigations performed on this population does not necessarily apply to an outpatient family practice population. The recent trend to more emphasis on community medicine during the training of family physicians might give physicians a more realistic view.

Patient expectations and the threat of litigation both emerged as factors significantly affecting test ordering. Respondents believed that patients expect more tests and investigations than they did 10 years earlier (in 1979) and that patient expectations affected their test-ordering behaviour. It might be useful to pursue the issues of patient expectations and patient perception of cost to determine whether patients do in fact expect more testing than they did in the past, and if so, why. It may also be useful to evaluate patients' perception of the cost of laboratory investigations, and to see whether knowledge of costs affects their expectations.

This group of physicians also reported they believed there was a greater risk of being involved in litigation in 1989 than there had been in 1979 and that this belief affected their test-ordering behaviour. In fact, while the incidence of litigation did rise over the 10 years, the increase was not dramatic. In 1980, the Canadian Medical Protective Association (CMPA) reported one new legal action for each 76 CMPA members. This number rose to one new legal action for each 47 CMPA members in 1985 but decreased to one in 55 during 1987 and one in 60 during 1989 (personal communication with Dr Stuart Lee, Secretary-Treasurer, CMPA, October 22, 1990).

Nevertheless, this group of Ontario physicians perceive a threat of litigation and believe it has altered their practice. This finding supports those of Woodward and Rosser,²⁴ who reported a number of changes in Canadian family physician behaviour in response to an increased perceived risk of litigation, including the ordering of more laboratory investigations. The same authors have since discussed some reasons Ontario physicians are even more sensitive to the threat of litigation than physicians in the rest of Canada.²⁵ It is impossible to completely reassure physicians about litigation, because there clearly are risks. However, as Rosser and Woodward point out, it is important to provide balanced, complete information to physicians, allowing them to be realistic about the risks but also aware of the problems associated with defensive medicine, including the recognition that increases in cost might not improve health care.

Physicians need the CMPA, the College of Physicians and Surgeons, the Ontario Medical Association, and the Ministry of Health to support their attempts to practise careful, sensible medicine. Rosser's suggestions are useful: to foster good physician-patient relationships as a means of decreasing the threat of liti-

office practice to the financial crisis in health care? Awareness of cost is important. More important is an awareness of the value of tests, and an ability and willingness to choose carefully from available tests, with an eye to the cost as well as to the benefit. If physicians are to help contain costs, they must see themselves as integral to the protection of available health care resources and see careful test-ordering behaviour as one element of the responsible use of those resources. ■

Table 3. Physicians' ability to estimate the cost of tests ordered: Cases where tests were not ordered or estimated cost was missing were excluded (n = 213)

ESTIMATED COST	UNDERESTIMATES	OVERESTIMATES
Within 10%	9.8%	6.6%
Between 10%-20%	5.6%	4.7%
> 20%	24.4%	48.8%

gation, and to remove immunizations from the threat of suit.²⁵

Residents' and interns' attitudes must be addressed. We need senior, respected physicians in teaching institutions to address issues of cost as well as excellence of care. If young physicians are taught to practise defensive medicine at the beginning of their careers, they will probably continue to practise this way no matter what the real risks of litigation are. As they learn their craft, books like the *Manual of Clinical Evaluation Strategies for Cost-Effective Care*²⁶ may provide a useful framework for medically sound, efficient problem solving that also conserves resources.

Some physicians believe guidelines for standards of care threaten the independent practice of medicine. However, such standards might allow physicians to stand firm in the face of patient demands for expensive and useless investigations. One example is the cooperative venture between the Ontario Ministry of Health and the Ontario Medical Association regarding the detection and management of asymptomatic hypercholesterolemia.²⁷ This project's effectiveness in affecting physician behaviour is now being evaluated. Canadian standards for the appropriate use of mammography screening should be a useful tool for physicians, given the political and emotional implications of the issues.

Physicians' perceptions of their role in cost containment is an important issue that requires exploration. Do physicians relate the conduct of their day-to-day

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